Remarks

Claims 9 and 18 are amended and dependent claims 26 and 27 are added. Claims 9 to 27 are pending in this application of which claims 9 and 18 are in independent form.

Claim 9 is amended herein to emphasize that the elastic spring body 2 shown in FIGS. 1 to 4 of applicants' drawings is a monolithic body as is evident from the section views of FIGS. 2 and 4. The disclosure is amended herein on page 3, line 17, to recite this feature shown in FIGS. 2 and 4 thereby conforming the written disclosure to the drawings.

Claim 9 is further amended to recite the feature of the U-shaped cavity identified in FIG. 2 by reference numeral 10. Also, claim 9 is amended to recite that one of the rigid end members has an opening formed therein as also shown in FIG. 2 with this opening being identified by reference numeral 8a. The opening 8a permits the U-shaped cavity to communicate with the ambient. The antecedent basis for these additional limitations is set forth in the applicants' disclosure on page 3, lines 19 to 24.

Claims 9 and 18 were rejected under 35 USC 103(a) as being unpatentable over Drescher et al in view of Pohlmann et al or Leonard. The following will show that claims 9 and 18, as amended, patentably distinguish the applicants' invention over this combination of references.

Applicants call attention to the fact that the three references applied against the claims here are directed to a

different class of spring, namely, an air spring which relies on a rolling-lobe type flexible member for its operation. In contrast, the applicants' invention is directed to that class of springs which are characterized by a monolithic elastic spring body made of rubber or a rubber-like plastic.

Claim 9 is amended to emphasize this feature and limitation in the fourth clause as follows:

> "said elastic spring body being a monolithic body of rubber or a rubber-like plastic ..." (emphasis added)

Applicants submit that our person of ordinary skill seeking to arrive at the applicants' invention would not look for inspiration amongst rolling-lobe air springs to arrive at a spring incorporating a monolithic body made of rubber. This is so because the spring action of rolling-lobe air springs as opposed to monolithic rubber air springs is basically very different.

Accordingly, it is clear to our artisan that air springs, which essentially comprise a hollow space enclosed by a rolling-lobe resilient member, operate with the resilient member rolling off on a connecting element by forming a rolling-lobe. These air springs support the load they carry with the aid of air under pressure and not as a monolithic rubber body.

On the other hand, a person of ordinary skill would know that in springs having a monolithic elastic spring body, this roll off movement would not take place. In the case of the monolithic elastic spring body, the entire spring comprises a rubber block which is pressed and comes into increasing contact against the connecting parts when the distance therebetween

becomes less. However, this does not take place in an air spring where there is a rolling-lobe type movement. The different types of movement result especially because, in air springs, the carrying force is generated by a high pressure space enclosed by a flexible wall. This flexible wall is itself configured as a thin-walled rubber rolling-lobe flexible member.

In the rubber spring of the applicants' invention, the carrying force is generated exclusively by the strength of the elastic spring body, that is, by the strength and the structure of the rubber body.

Applicants' claim 9 is amended to include the further features and limitations referred to above of:

> "said elastic spring body having a substantially U-shaped cavity formed therein so as to impart said biconvex shape to said elastic spring body when viewed in longitudinal section; and,
>
> one of said rigid end members having an opening formed therein lying opposite said U-shaped cavity to permit said U-shaped cavity to communicate with the ambient." (emphasis added)

These features and limitations show that the U-shaped cavity communicates with the ambient so that the use of air under pressure in the operation of the applicants' spring is not possible thereby placing the applicants' spring well beyond the reach of a person exercising only ordinary skill trying to arrive at the applicants' invention from a combination of Drescher et al, Pohlmann et al and Leonard.

The applicants add that the person of ordinary skill knows that the movement sequences in the spring of the applicants'

invention and the air springs of the applied references are completely different, namely, in the air spring, a rolling action takes place with the rolling-lobe flexible member; while, in the rubber spring body, essentially a sliding or gliding takes place.

The primary reference, Drescher et al, is directed to an air spring, that is, a spring of the class which is very different from that of the applicants' invention and wherein the surface of the rolling-lobe flexible member is intended to roll off on a connecting part and is provided with ribs which extend essentially in the direction of movement.

These ribs are identified in Drescher et al by reference numeral 6 and are connected by narrow crosspieces 7 that are lower in elevation than the ribs 6 as emphasized in Drescher et al at column 2, lines 62 to 66:

> "...Disposed in the spaces between two adjacent ribs, are relatively narrow crosspieces **7** that <u>are lower</u> than the ribs **6**; these crosspieces **7** are integrally formed onto the bellows wall in the transverse direction." (emphasis added)

From the above, it can be seen that even if our person of ordinary skill would do the unexpected and consult Drescher et al, our artisan still would not be able to arrive at the feature and limitation set forth in applicants' claim 9 as now amended, namely:

> "said second plurality of ribs intersecting said first plurality of ribs so as to form a multiplicity of intermediate spaces defining a corresponding plurality of polygonal areas or cavities on said surface wherein air collects to become trapped between said spring body and said rigid end members <u>to form a plurality of air pillows</u> as said

rigid end members move toward each other so as to permit said elastic spring body to slide on said air pillows;" (emphasis added)

The ribs 6 in Drescher et al roll in the direction of movement on the connecting part and minimize the rolling friction in that a contact between the rolling-lobe flexible member and the connecting body is essentially limited only to the surface of the ribs 6. The intermediate space between the ribs wherein the crosspieces 7 are located remain essentially free from contact with the connecting part of the air spring and, since crosspieces 7 are significantly lower in elevation, no air pillows can form.

From the foregoing it can be seen that not only is Drescher et al directed to a different class of spring but the ribs 6 provided on the rolling-lobe flexible member thereof function to achieve a different purpose, namely, to reduce the rolling friction between the rolling-lobe flexible member and the connecting part of the air spring.

The void left by Drescher et al is substantial and applicants submit that the secondary references Pohlmann et al and Leonard cannot fill this void.

Pohlmann et al is also directed to a rolling-lobe flexible member for an air spring and therefore belongs to the same class of springs as does the rolling-lobe flexible member of Drescher et al.

The air spring rolling-lobe flexible member of Pohlmann et al has a rib structure formed on the inner side thereof which has no rolling direction. The purpose of the rib structure in Pohlmann et al is to provide a reinforcement of the

thin air spring wall in the case that the air spring is without pressure, that is, for the case wherein the air pressure in the air spring can no longer be maintained so that the carrying force can no longer be supported. The reinforcement is intended to prevent the thin wall flexible member from becoming destroyed because of friction in the emergency situation wherein there is a loss of air pressure.

Accordingly, the rib structure in Pohlmann et al does not operate to reduce friction in a rolling-lobe movement but simply to increase the strength in the case of an undefined folding or deformation of the rolling-lobe flexible member when the air spring is in the pressureless state and has collapsed.

Leonard too describes a spring belonging to the class of air springs having an air spring rolling-lobe flexible member. This reference was cited because it too shows an intersecting rib arrangement at the bottom region of the bellows 8. However, Leonard is silent as to what is intended with this rib arrangement. All we are told is that the bellows 8 is preferably made of rubberized cord material or plastic, and so constructed as to allow the air spring to extend and compress smoothly without wrinkles. Accordingly, this reference too cannot fill the void left by Drescher et al.

Whereas Drescher et al places the ribs on the outer side of the air spring rolling-lobe flexible member in order to reduce friction, Pohlmann et al provides ribs on the inner side of the air spring rolling-lobe flexible member in order to increase the strength of the flexible member in the case of a collapse. Finally, in Leonard, clamping ribs are provided at the lower end

of the air spring rolling-lobe flexible member in order to improve clamping between the flexible member and the connecting part.

From the foregoing, it can be seen that the above combination of references can not provide any suggestion which would lead our person of ordinary skill to:

(a) transfer the various types of ribs on the inner or outer side of an air spring rolling-lobe flexible member to a rubber spring body which belongs to an entirely different class of springs as described above; and,

(b) to then so alter these types of ribs to form a rib structure so that the ribs, with the aid of polygonal-type hollow spaces, can enclose air pillows on which the elastic spring body can slide as set forth in applicants' claim 9.

For the reasons advanced above, applicants respectfully submit that the combination of Drescher et al, Pohlmann et al and Leonard cannot render the applicants' invention obvious. Accordingly, claim 9 should now patentably distinguish the applicants' invention over this combination of references and be allowable. Claim 18 is amended herein to substantially the same extent as claim 9 so that this claim too should patentably distinguish the applicants' invention over this combination of references.

The claims 10 to 17 and 19 to 25 were rejected under 35 USC 103(a) as being unpatentable over Drescher et al in view of Pohlmann et al or Leonard as applied to claims 9 and 18 in further view of Fukumura et al.

The applicants will now address this rejection and show that

these claims patentably distinguish their invention over this combination of references.

Drescher et al, Pohlmann et al and Leonard have been discussed above and it has been shown that they are all directed to air springs and leave a void which applicants submit cannot be filled by Fukumura et al. Fukumura et al is cited because it shows a coating applied to an elastic spring body. However, this spring body is not a monolithic body made of rubber or a rubber-like plastic. Instead, in Fukumura et al, a metal bellows 31 is coated with a low-friction layer 38 as described in column 3 at lines 47 to 49, of this reference. This metal bellows separates an oil-filled space from a gas-filled space.

In view of the above, claims 10 to 17 and 19 to 25 should now likewise be allowable.

Claims 9 and 18 were rejected under 35 USC 103(a) as being unpatentable over Korean publication 20-0032657 (KR'657) in view of Pohlmann et al or Leonard. The following will show that claims 9 and 18 also patentably distinguish the applicants' invention over this combination of references.

KR'657 was applied against claims 9 and 18 because it was believed to be very similar to the applicants' spring, lacking a specific description of the rib arrangement. Applicants submit that their spring as defined in claim 9 is indeed very different from that shown in KR'657.

Exhibit A is attached to this amendment and shows three views of KR'657 which are identified in the exhibit as FIGS. I to III. FIGS. I to III show that the structure of the spring of KR'657 is not a monolithic structure but a hollow structure

having air spaces identified, for example, by reference numerals 8 and 8'. Also, there is no suggestion here of a monolithic elastic spring body having a biconvex shape.

In contrast to KR'657, applicants' claim 9 recites:

> "said elastic spring body having a rotationally symmetrical cross section and a longitudinal section having biconvex shape;
>
> said elastic spring body being a monolithic body of rubber or a rubber-like plastic and having a surface which is pressed with more or less area of said surface against said rigid end members as said distance becomes shorter or longer during said operation;" (emphasis added)

This shows that the applicants' spring is not at all similar to the spring of KR'657. Accordingly, it can be seen that there is no way in which our person of ordinary skill could arrive at the above features from a study of KR'657 as shown in this reference and in Exhibit A attached hereto.

Applicants next call attention to the fact that both ends of the KR'657 spring have elevated plateau-like ends identified by reference numerals 2 and 2'. Also, there is a distance between these plateaus and where the ribs end. This distance is indicated in FIG. I of Exhibit A by reference character B. Accordingly, even if our person of ordinary skill would hit upon the idea of placing two rigid end members on the plateaus 2 and 2', it would not be possible for the ribs to coact therewith to form the air pillows cited in applicants' claim 9 with the clause:

> "said second plurality of ribs intersecting said first plurality of ribs so as to form a multiplicity of

> intermediate spaces defining a corresponding plurality of polygonal areas or cavities on said surface wherein air collects to become trapped between said spring body and said rigid end members to form a plurality of air pillows as said rigid end members move toward each other so as to permit said elastic spring body to slide on said air pillows;" (emphasis added)

The coaction described above would not be possible with the spring of KR'657 because of the step B. This can be seen especially well in FIGS. II and III of Exhibit A which shows KR'657 spring in the unloaded and loaded states, respectively. It can be seen especially from FIG. III that the distance B would necessarily preclude such coaction.

We now turn to another feature of applicants' spring not suggested in KR'657.

The biconvex shape of the applicants' spring comes about because of the cavity 10 shown in FIGS. 2 and 4 of the applicants' drawings. This cavity is now positively recited in claim 9 with the clauses:

> "said elastic spring body having a substantially U-shaped cavity formed therein so as to impart said biconvex shape to said elastic spring body when viewed in longitudinal section; and,
>
> one of said rigid end members having an opening formed therein lying opposite said U-shaped cavity to permit said U-shaped cavity to communicate with the ambient."

There is no suggestion anywhere in KR'657 which could lead our person of ordinary skill to hit upon the idea of providing the cavity and the opening in one of the rigid openings which

opening lies opposite the cavity to permit the cavity to communicate with the ambient.

Also, it is noted that even if the plateaus were not provided on KR'657, there could be no coaction with a rigid end member and the surface of the spring body to form the air pillows because the ribs 3 extending upwardly and downwardly along the outer surface are at a higher elevation than the lateral ribs 4. This can be seen with special clarity in FIG. I of Exhibit A by looking at where the ribs intersect, for example, at location C. The lateral ribs 4 have a much lower profile or elevation than the up and down running ribs 3. Thus, an air pillow could not be formed in the polygonal areas or pockets formed on the surface of the spring body when coacting with a hypothetical plate mounted at the ends (2, 2') with the plateau hypothetically removed because the air could not be trapped in the pockets as set forth in applicants' claim 9.

Pohlmann et al was applied in combination with KR'657 because it showed an air spring having an intersecting rib arrangement at reference numeral 8. Aside from the fact that Pohlmann et al is directed to an air spring, namely, a spring wherein the load is carried by air under pressure, the rib arrangement at 8 is arranged on the inside of the rolling-lobe flexible member 3 and cannot coact with an end to form pockets of trapped air to form air pillows and permit a sliding action thereon.

The secondary reference, Leonard, was also applied against claims 9 and 18 in combination with KR'657. However, this reference too cannot fill the void left by KR'657.

Leonard was cited because it too shows an intersecting rib arrangement at the bottom region of the bellows 8. However, Leonard is silent as to what is intended with this rib arrangement. All we are told is that the bellows 8 is preferably made of rubberized cord material or plastic, and so constructed as to allow the air spring to extend and compress smoothly without wrinkles. Accordingly, it is not seen how this reference can be combined with KR'657 to arrive at the applicants' invention.

Applicants add that if, by some happenstance, our person of ordinary skill would consult Drescher et al, our artisan would see that vertical ribs have a higher profile than the horizontal ribs so that our artisan could not transfer this idea to the primary reference KR'657.

In view of the foregoing, it is not seen how the rubber spring of KR'657 can be combined with the air spring of Pohlmann et al or any of the other references to arrive at the applicants' invention so that claim 9 should now also patentably distinguish the applicants' invention over this combination of reference. Claim 18 is amended herein in a similar manner to claim 9 so that this claim too should be allowable as should the dependent claims 10 to 17 and 19 to 25 which are dependent from claims 9 and 18, respectively.

For the reasons advanced above, applicants submit that their claims, as amended herein, patentably distinguish their invention over the combinations of references applied thereagainst so that they should now be allowable.

Reconsideration of the application is earnestly solicited.

Respectfully submitted,

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Date: August 20, 2008